

WHAT IS CLAIMED IS:

1. A method for fabricating a semiconductor device comprising the steps of:

forming a first insulation film over a semiconductor substrate;

forming a semiconductor film over the first insulation film;

forming a resist film over the semiconductor film;

forming openings in the resist film;

etching the semiconductor film with the resist film as a mask;

etching the first insulation film with the semiconductor film as a mask; and

etching the semiconductor substrate with the first insulation film as a mask to form trenches in the semiconductor substrate.

2. A method for fabricating a semiconductor device according to claim 1,

which further comprises, after the step of forming the trenches in the semiconductor substrate, the step of burying element isolation regions of a second insulation film in the trenches.

3. A method for fabricating a semiconductor device according to claim 1, wherein

in the step of forming trenches in the semiconductor

substrate, the trenches are formed in the semiconductor substrate and etching off the semiconductor film over the first insulation film.

4. A method for fabricating a semiconductor device according to claim 2, wherein

in the step of forming trenches in the semiconductor substrate, the trenches are formed in the semiconductor substrate and etching off the semiconductor film over the first insulation film.

5. A method for fabricating a semiconductor device according to claim 1, wherein

the step of etching the semiconductor film and the step of etching the first insulation film are performed without the exposure to the atmosphere.

6. A method for fabricating a semiconductor device according to claim 2, wherein

the step of etching the semiconductor film and the step of etching the first insulation film are performed without the exposure to the atmosphere.

7. A method for fabricating a semiconductor device according to claim 5, wherein

the step of etching the semiconductor film and the step of etching the first insulation film are performed in one and the same chamber.

8. A method for fabricating a semiconductor device according to claim 6, wherein

the step of etching the semiconductor film and the step of etching the first insulation film are performed in one and the same chamber.

9. A method for fabricating a semiconductor device according to claim 5,

which further comprises, after the step of forming a semiconductor film and before the step of forming a resist film, the step of forming an anti-reflection film, and

in which the step of etching the anti-reflection film to the step of etching the first insulation film including the first insulation film etching step are performed without exposure to the atmosphere.

10. A method for fabricating a semiconductor device according to claim 6,

which further comprises, after the step of forming a semiconductor film and before the step of forming a resist film, the step of forming an anti-reflection film, and

in which the step of etching the anti-reflection film to the step of etching the first insulation film including the first insulation film etching step are performed without exposure to the atmosphere.

11. A method for fabricating a semiconductor device according to claim 9, wherein

the step of etching the anti-reflection film to the step of etching the first insulation film including the first insulation film etching step are performed in one and the same

chamber.

12. A method for fabricating a semiconductor device according to claim 10, wherein

the step of etching the anti-reflection film to the step of etching the first insulation film including the first insulation film etching step are performed in one and the same chamber.

13. A method for fabricating a semiconductor device according to claim 1,

which further comprises, after the step of etching the first insulation film and before the step of forming the trenches in the semiconductor substrate, the step of removing the resist film.

14. A method for fabricating a semiconductor device according to claim 2,

which further comprises, after the step of etching the first insulation film and before the step of forming the trenches in the semiconductor substrate, the step of removing the resist film.

15. A method for fabricating a semiconductor device according to claim 1,

which further comprises, after the step of etching the semiconductor film and before the step of etching the first insulation film, the step of removing the resist film.

16. A method for fabricating a semiconductor device according to claim 2,

which further comprises, after the step of etching the semiconductor film and before the step of etching the first insulation film, the step of removing the resist film.

17. A method for fabricating a semiconductor device according to claim 2, wherein

the step of burying the element isolation regions comprises the step of forming the second insulation film in the trenches and on the first insulation film and the step of polishing the second insulation film until the first insulation film is exposed.

18. A method for fabricating a semiconductor device according to claim 1, which further comprises, after the step of forming element isolation regions, the steps of:

etching off the first insulation film; and

forming a gate insulation film over the semiconductor substrate.

19. A method for fabricating a semiconductor device according to claim 1, wherein

the semiconductor film is a polysilicon film or an amorphous silicon film.

20. A method for fabricating a semiconductor device according to claim 2, wherein

the first insulation film is a silicon nitride film; and  
the second insulation film is a silicon oxide film.